"Baratta, Bob"
<bbaratta@freebornpeters.com>
12/21/2007 03:09 PM

To Cathleen Martwick/R5/USEPA/US@EPA, Mary Fulghum/R5/USEPA/US@EPA
cc VERNETA SIMON/R5/USEPA/US@EPA, EUGENE JABLONOWSKI/R5/USEPA/US@EPA, <kworthington@cityofchicago.org>,
bcc

Subject DuSable

History: This message has been forwarded.

<<R200702842-SOW_12-21-07.pdf>> <<200702842-SOW_Appendices.pdf>> <<200702842-SOW_Figure_1.pdf>>

Cathy and Mary,

Attached is the scope of work for the removal of the known areas of impacted material on DuSable. Steve Kornder of STS sent a hard copy of the scope of work to Verneta today. Please call me with any questions. Happy Holidays!

**Robert M. Baratta, Jr.**

**Freeborn & Peters LLP**

**311 South Wacker Drive**

**Chicago, IL 60606**

**312.360.6622**

**312.360.6597 - Fax**

**bbaratta@freebornpeters.com**

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200702842-SOW_Appendices.pdf


200702842-SOW_Figure_1.pdf

STS | AECOM

# Scope of Work for Removal of Radiologically-Impacted Material

**DuSable Park**

STS Project No. 200702842
December 21, 2007

STS | AECOM

750 Corporate Woods Parkway
Vernon Hills, IL 60061
P 847-279-2500/F 847-279-2510

December 21, 2007

Ms. Verneta Simon
U. S. Environmental Protection Agency, Region 5
77 W. Jackson Blvd., SE-5J
Chicago, Illinois 60604

Re: Scope of Work for Removal of Radiologically-Impacted Material, DuSable Park, Chicago, Illinois – STS Project No. 2000702842

Dear Ms. Simon:

Enclosed please find the Scope of Work for the above-referenced site for your review and comment. We have provided two additional copies for your use and distribution.

Please contact us with any questions or comments you may have regarding the plan.

Regards,

Steven C. Korndér, Ph.D.
Senior Project Geochemist

Don MacDonell
Associate Scientist

cc: Robert M. Baratta, Jr. Freeborn & Peters LLP
Niall Collins, Shelbourne Development Group

# Table of Contents



**Figures**



**Appendices**

# SCOPE OF WORK FOR THE REMOVAL OF RADIOLOGICALLY-IMPACTED MATERIAL - DUSABLE PARK

## 1.0 Introduction

This Scope of Work addresses the removal of specific known areas of radiologically-impacted material located on DuSable Park (Site) from prior investigation. The Scope of Work describes the:

- Survey methods proposed for identifying radiologically-impacted materials above the 7.1 picocuries per gram (pCi/g) cleanup threshold (Applicable Cleanup Standard) within the areas of known contamination; and

- Procedures for managing the removal of radiologically-impacted soil above the Applicable Cleanup Standard.

Radiologically-impacted material that is excavated will be transported to a disposal facility licensed to dispose of this material or otherwise addressed in accordance with USEPA direction and/or agreement.

# 2.0 Background

## 2.1 Site Location

The DuSable Park Site is located in an area of reclaimed land where fill material was placed along the Lake Michigan shoreline beginning in the 1860s. Several properties north of the Chicago River in the Streeterville neighborhood of Chicago exhibit evidence of radiological-impacts evidently from the former processing of thorium-bearing mineral sands by Lindsay Light and Chemical Company. Lindsay Light facilities operated in Streeterville at 22 West Hubbard, 316 East Illinois, and 161 East Grand.

The Site contains six (6) areas of known radiologically impacted soils based on previous studies and recent field investigations by STS and USEPA personnel.

## 2.2 ProSource 2002 Limited Site Investigation/STS Investigation (2007)

In October 2002, ProSource Technologies, on behalf of Kerr-McGee Corp., performed a gamma radiation surface survey of the Site. ProSource Technologies reportedly detected elevated levels of thorium on the Site and some remediation/removal of impacted material was reportedly conducted. ProSource Technologies identified five (5) areas in which radiation concentrations exceeded the Applicable Cleanup Standards.

During June and July of 2007, STS conducted surface surveying on portions of the site adjacent to the seawall along the Chicago River and the Ogden Slip. No elevated levels of thorium were detected in these areas along the perimeter of the Site. In addition, the USEPA revisited the five areas identified in 2002 by ProSource Technologies. Each of the areas consisted of a shallow pit filled with numerous orange sand bags, which appeared to be underlain by a sheet of black plastic. Gamma readings were made at the top or edges of the sand bags (*i.e.*, the sand bags were not removed to obtain readings directly over the pit soils). Unshielded Ludlum readings obtained by STS at the time of the USEPA surveys appeared to confirm the USEPA results with values ranging from 15,000 to 21,300 counts per minute ("cpm") (generally, 18,563 cpm = 7.1 pCi/g). These five areas have been cordoned off with chain link fencing and/or concrete barriers, and posted with caution signs, in accordance with USEPA direction. A copy of the ProSource Limited investigation is enclosed in Appendix A.

Additionally, STS identified a sixth area of radiologically-impacted material during the screening work for the construction of the ramp in the northwest portion of the Site. STS cordoned this area off with fencing and concrete barriers and installed caution signs.

The six areas of known radiologically-impacted material are depicted on Figure 1.

# 3.0 Excavation of Radiologically-Impacted Soil

The radiologically-impacted material that is located in the six areas depicted in Figure 1 will be excavated and properly manifested and disposed of at a licensed, off-site facility by Tronox, LLC, a successor to Kerr-McGee Corp. The excavation process will utilize an excavator with a maximum one cubic yard (CY) bucket. This bucket size will facilitate loading the containers without spilling and/or spreading the contamination. When possible, the impacted soil will be loaded directly into transport boxes and/or super sacks. If utilized, transport boxes will be lined, covered, sealed, and the exteriors confirmed clean prior to leaving the Site, in accordance with SOP-320 (Appendix B).

The remediation of these six areas will be confirmed by surveys conducted during the excavation process. Once the confirmation survey has confirmed the absence of impacted soil (SOP-210), the excavation will be available to verification survey and sampling by USEPA in accordance with SOP-223 and SOP-214 (Appendix B). STS will notify USEPA at least seven (7) days in advance of the commencement of the planned work.

# 4.0 Methods

## 4.1 Applicable Cleanup Standard

The USEPA has set a cleanup level at 5 pCi/g total radium (Ra-226 and Ra-228) above the background. A level of 2.1 pCi/g total radium is currently considered background for the Streeterville area, within which the Site is located, by the USEPA. Thus, radiologically-impacted material is defined by the USEPA for the Streeterville area as fill material which exceeds a threshold of 7.1 (pCi/g) total radium.

Field measurements will be taken of gamma radiation levels using a Ludlum 2221 rater-scaler and a 2 x 2 NaI detector. The equipment is calibrated to determine the gamma count in cpm that is equivalent to 7.1 pCi/g. Equipment calibration is performed at least annually using the thorium calibration blocks at the Tronox West Chicago Rare Earth Facility. A copy of the most recent calibration records is included in Appendix C.

## 4.2 Confirmation Surveys for Radiologically-Impacted Areas

Confirmation screening surveys will be conducted during the remedial excavation of the six areas depicted in Figure 1. Excavated locations will be screened in accordance with SOP-210 (Appendix B).

During remediation of radiologically-impacted materials above the Applicable Cleanup Standard, fill/soil within the six areas that has not been documented as clean will be surveyed in-place. Remedial excavation activities will proceed in lifts not to exceed 18 inches in thickness and otherwise will be conducted in accordance with SOP-217 (Appendix B). If an increase in gamma radiation is noted on the order of twice background values, excavation will proceed in thinner lifts to minimize the potential for mixing clean and radiologically-impacted soil.

Soil screening during the course of the remedial excavation activities is intended to minimize the mixing of clean material into materials which are designated for radiological disposal. Soil indicative of levels below 7.1 pCi/g total radium by the confirmation screening process prior to excavation will be staged for potential use as backfill. As previously indicated, excavation conducted to remove radiologically-impacted material will proceed using an excavator with a maximum 1 CY bucket. This bucket size also will allow the excavated soil to be screened a second time before being placed on the backfill pile. This potentially non-impacted soil also will be subject to verification surveys in accordance with SOP-214 (Appendix B).

Prior to the initiation of activities, gamma count rate background levels shall be established for each applicable survey instrument. Six locations shall be chosen in non-radiologically-impacted areas of the Site. A one-minute integrated count shall be obtained at the surface of each location for each survey instrument (Ludlum 2221 with 2" x 2" NaI probe). The measurements collected from each location shall be averaged to establish instrument specific background gamma count rates.

## 4.3 Verification Sampling

Soil exhibiting contamination in levels above the Applicable Cleanup Standard will be excavated, placed in transport boxes and shipped to a disposal facility licensed to receive this material. Excavated locations will be screened in accordance with SOP-210 (Appendix B). To demonstrate that the Applicable Cleanup Standard has been achieved, a verification sampling program will be conducted in general accordance with SOP-223 and SOP-214 (Appendix B).

A shielded 2 x 2 NaI detector will be used to demonstrate, at least initially, that the location has been appropriately remediated. Pre-verification samples will be collected and analyzed using NUTRANL software or gamma spectroscopy analyses by Huber Consultants Inc. It is anticipated that both the NUTRANL software and gamma spectroscopy analyses will be conducted at an off-site (fixed) laboratory. Samples for high resolution gamma spec analysis will be sent to a subcontract laboratory operated by RSSI. The laboratory data package will include chain-of-custody copies, sample receipt and tracking forms, preparation and analysis logbooks, raw data forms, tabulated data summaries, calibration records and standards, QC sample results, and any corrective action reports (refer to SOP-364 in Appendix B). Gamma spec analysis will be conducted using a Library Energy Tolerance of 1.2 keV and a Gamma Fraction Limit of 71%.

If utilized, NUTRANL results would be provided in two forms. The initial NUTRANL data set will consist of one set per sample and will include: (1) the radionuclide concentrations and error limits for uranium 238, thorium 232, radium-226, and potassium 40; (2) the sample number; (3) date and time sampled; (4) laboratory number (sequential); (5) identity of the analyst; and (6) analytic method (NUTRANL). The second field lab data form will be a consolidated spreadsheet with all analysis in sequence by laboratory number. This table will include the sample number, data and time sampled, radionuclide concentrations and error limits for the four NUTRANL analytes, and a line totaling the thorium and radium concentrations. The field laboratory also will maintain a copy of the chain-of-custody for those samples received and analyzed.

## 4.4 Materials Management

At present, it is anticipated that the radiologically-impacted material encountered above the Applicable Cleanup Standard will be sent to Energy Solutions Clive Facility (f/k/a Envirocare), located in Clive, Utah. Shipping and placarding will be in accordance with all Department of Transportation (DOT) regulations for shipping radiologically-impacted material. Permitting for disposal at Energy Solutions Clive Facility will be arranged before impacted material is loaded for shipment.

## 4.5 Decontamination

All discarded materials, waste materials, and other field equipment and supplies shall be handled in such a way to prevent the potential spread of contamination during excavation and restoration activities. Discarded items that have contacted contaminated materials will be containerized and stored for disposal at the approved disposal facility. Non-contaminated items to be discarded will be collected for disposal as general refuse waste. Personnel and sampling equipment decontamination are described in the Decontamination Procedure included as SOP-347 (Appendix B).

## 4.6 Site Contacts

The following persons will be the primary contacts for the radiological remediation work:

Don MacDonell
STS Consultants, Ltd.
111 West Washington Street, Suite 1750
Chicago, Illinois 60602
(312) 307-7293

Steve Kornder
STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, Illinois 60061
(847) 279-2448

# 5.0 References

ProSource Technologies-Limited Site Investigation-June-2002

USEPA letter dated December 1, 2000.

## APPENDIX A

**ProSource Technologies Limited Site Investigation- June-2002**

## APPENDIX B

### Standard Operating Procedures

| | |
|---|---|
| SOP-210 | Gamma Radiological Surveys |
| SOP-214 | Soil Sampling Procedure |
| SOP-217 | Excavation Procedure |
| SOP-223 | Verification Survey |
| SOP-320 | Radioactive Material Shipments |
| SOP-347 | Decontamination |
| SOP-364 | Sample Preparation Procedure for Gamma Spectral Analysis |

# APPENDIX C

## Instrument Calibration

APPENDIX A

**ProSource Technologies Limited Site Investigation- June-2002**

277 Coon Rapids Blvd. • Suite 304 • Coon Rapids, MN 55433 • Phone (763) 786-1445 • FAX (763) 786-1030 • www.prosourcetech.com

June 12, 2002

COPY

Mr. Bernard Bono
Senior Engineer
Kerr-McGee Chemical LLC
800 Weyrauch Street
West Chicago, Illinois 60185

Re: DuSable Park Limited Site Investigation
Chicago, Illinois
ProSource Project No. 386-00

Dear Mr. Bono:

ProSource Technologies, Inc. (ProSource) is pleased to submit this letter report to Kerr-McGee Chemical LLC (KM) which presents the results of the recently completed Limited Site Investigation at the DuSable Park Site (Site) in Chicago, Illinois (Figure 1). All field work was completed in accordance with the *Investigation Work Plan, DuSable Park Site* (Work Plan) dated November 12, 2001 and last revised March 21, 2002. All work was also supervised by United Stated Environmental Protection Agency (USEPA) staff. The following sections present a summary of the field work activities, a presentation of the data, and a discussion of the results.

## Summary of Field Work Activities

As outlined in the Work Plan, the work included a limited investigation of four previously identified areas of concern (Figure 2). Generally, the work included a surface gamma survey, downhole gamma logging, soil sampling, sample preparation, surveys for unrestricted release of equipment, and decontamination. Initially, surface gamma surveys were conducted of each area of concern. The surface gamma surveys were completed using a Ludlum® Model 2221 equipped with a Ludlum® Model 44-10 probe which were coupled to a Trimble® Model Pro-XR global positioning system (GPS) unit and a hand-held datalogger. The datalogger recorded the physical locations and gamma readings during the surface gamma survey. Where feasible, the surface gamma surveys extended at least 10 meters laterally of any elevated gamma readings.

Upon completion of the surface gamma survey, the data was processed to determine the areas with the highest gamma readings. At the point of the highest surface gamma reading in each area, the GPS unit was used to navigate back to five small areas of elevated gamma readings (Figures 3 through 6). A test hole was then advanced vertically by driving a steel casing to a depth of two feet via hand or mechanical methods. The borehole was then gamma logged with a calibrated meter to determine if radioactive material was present in concentrations exceeding 7.1 picocuries per gram (pCi/g). In each case, material exceeding the criteria was encountered within the upper two feet resulting in the test hole being advanced to a deeper depth and four additional test holes (or step outs) being advanced surrounding the initial test hole.

Upon completion of the gamma logging, shallow soil samples were collected using a stainless steel hand auger from the depth corresponding to the highest downhole gamma reading. In each case, a soil sample was collected from three to nine inches below grade which corresponded to the six inch depth interval of the test hole. The sample was throughly composited in the field and rocks, sticks and foreign objects greater than approximately one-inch were removed. Approximately four pounds of the field sample was placed into sturdy water tight bags

for transport to the KM laboratory located in West Chicago, Illinois. Once the field sample was collected, the remaining soil was given to USEPA field staff who in turn conducted additional screening and compositing in the field.

Soils encountered at each sampling location were typically classified as very dark brown to black, silty fine to medium grained sand with gravel. Fragments of coal, slag, brick and concrete were typically present at all locations.

Upon completion of all field sampling activities, all drilling locations and pertinent land features were surveyed utilizing a Trimble® Model TTS 500 Total Station. Copies of the surface gamma survey data are included in Attachment A. Copies of the Borehole Field Logs, field notes and meter calibration data are included in Attachment B. The KM laboratory report is included in Attachment C.

## Data Summary

### *Surface Gamma Survey*

As previously stated, the initial task was to complete a surface gamma survey. Figures 3 through 6 present the results of the surface gamma surveys. During the survey, over 2,946 data points were obtained with only 67 data points exhibiting gamma readings above the 7.1 pCi/g criteria. The 67 points were determined to be very localized and confined to five small areas. Table 1 presents the location and highest gamma readings for each area of concern. As shown in Table 1, the highest gamma readings ranged from a low of 7.9 pCi/g at surface gamma survey data point 512 to a high of 17.7 pCi/g at surface gamma survey data point 2756.

### *Downhole Gamma Logging*

Initially, one test hole was advanced at surface gamma survey data points 512, 832, 1951 and 2756. Table 2 presents the results of the gamma logging for each test hole and Figure 6 depicts each test hole location. Each test hole was advanced to a minimum depth of 24 inches with some extending to deeper depths. Downhole gamma readings above the 7.1 pCi/g criteria equivalent of 1,849 counts per minute (cpm) from each of the initial four test holes ranged from a low of 7.9 pCi/g at test hole 512 to a high of 13.3 pCi/g at test hole 832. In each case, the highest gamma reading was obtained from the six inch depth interval of each test hole resulting in the advancement of four "step out" test holes. It should be noted that no gamma readings were obtained above the 7.1 pCi/g criteria equivalent of 1,849 cpm in any of the other "step out" test holes including surface gamma survey point 1826 which was utilized as a southern step out for test hole 1951.

### *Laboratory Results*

Analysis of the four collected soil samples was performed by the KM laboratory in West Chicago, Illinois. Samples were prepared and gamma ray spectral analysis was performed using Canberra® HPGe detector system. The KM laboratory report is included in Attachment C. Samples were quantified for total radium as follows:

Total Radium (Ra) = Lead (Pb) 214 + Actinium (Ac) 228
Pb 214 is in the Uranium (U) 238 chain and is a measurement of Ra 226
Ac 228 is in the Thorium (Th) 232 chain and is a measurement of Ra 228
Therefore,
Total Radium = Ra 226 + Ra 228

Table 3 presents a summary of the KM laboratory results. Total Radium was identified above the 7.1 pCi/g criteria in samples collected from test holes 512 (11.7 pCi/g), 832 (9.5 pCi/g) and 1951 (15.0 pCi/g). Total Radium identified at test hole 2756 was 0.58 pCi/g which is well below the 7.1 pCi/g criteria.

**Discussion of Results**

*Surface Gamma Survey*

As presented above, surface gamma readings identified above the 7.1 pCi/g criteria were identified at five localized areas of the Site. Average surface gamma readings were observed below the 7.1 pCi/g criteria for 100 square meters surrounding each of the four highest target areas (Table 1) as follows (Attachment D):

| | |
|---|---|
| 3.7 pCi/g | Gamma point 512 (202 points) |
| 3.7 pCi/g | Gamma point 832 (255 points) |
| 4.2 pCi/g | Gamma point 1951 (386 points) |
| 3.9 pCi/g | Gamma point 2756 (249 points) |

In all cases, the identified surface gamma readings above the 7.1 pCi/g criteria were determined to be very localized and generally confined to areas less than one meter in diameter.

*Downhole Gamma Logging*

Gamma readings identified above the 7.1 pCi/g criteria were typically identified at the six inch depth interval at each of the four initial test holes. Thickness of readings above 7.1 pCi/g were six inches at test holes 832 and 2756, 12 inches at test hole 512, and 24 inches at test hole 1951. A minimum of two gamma readings below 7.1 pCi/g were obtained from the bottom of each test hole.

Average gamma readings for the six inch depth interval at each initial test hole and corresponding "step out" test holes were observed well below the 7.1 pCi/g criteria at all locations. Specifically, the average gamma readings at the six inch depth interval for each test hole group were 4.5 pCi/g at 512, 4.4 pCi/g at 832, 4.9 pCi/g at 1951 and 3.5 pCi/g at 2756.

In all cases, the identified downhole gamma measurements were identified less than 24 inches in depth and not identified in any "step out" test holes which further supports the findings that the gamma readings are not laterally extensive.

*Laboratory Data*

Four samples were analyzed by the KM laboratory using gamma ray spectral analysis. Total Radium was identified slightly above the 7.1 pCi/g criteria in three of the samples collected from test holes ranging in gamma activity from 9.2 pCi/g to 15.0 pCi/g. Generally, the soil sample results are comparable to the downhole gamma readings in that the gamma readings are slightly elevated above the 7.1 pCi/g criteria.

However, total Radium identified at test hole 2756 was 0.6 pCi/g which is well below the 7.1 pCi/g criteria. This result does not compare favorably with the downhole gamma measurement of 2,667 cpm or 10.2 pCi/g. The

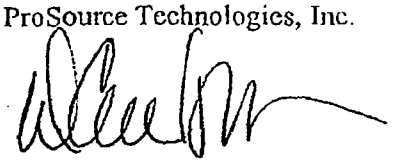
source of the elevated downhole gamma measurement is likely a piece of oversized material such as a brick, slag or coal fragment. Oversized material (>1 inch diameter) were segregated from the soil matrix during soil sampling in accordance with the DuSable Park Soil Sampling Work Instruction included in the Work Plan.

**Closing**

I sincerely appreciate the opportunity to conduct the Limited Site Investigation at DuSable Park. If you have any questions, please do not hesitate to contact me at (763) 786-1445.

Very truly yours,

ProSource Technologies, Inc.



Wade A. Carlson
Senior Geologist/Project Manager

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# TABLES

TABLE 1
Summary of Highest Surface Gamma Survey Points
DuSable Park
Chicago, Illinois
ProSource Project No. 00-386

| Surface Gamma Survey ID Number | Easting | Northing | GPS Date | GPS Time | Gamma (cpm) | Gamma (pCi/g) | Survey Type |
|---|---|---|---|---|---|---|---|
| 512 | 1180378.80 | 1903282.07 | 5/3/02 | 10:36:37AM | 8,062 | 8.92 | Pro XR |
| 832 | 1180334.37 | 1902987.89 | 5/3/02 | 10:55:56AM | 8,910 | 9.85 | Pro XR |
| 1826 | 1180233.58 | 1903113.83 | 5/3/02 | 11:33:26AM | 7,142 | 7.90 | Pro XR |
| 1951 | 1180218.27 | 1903130.36 | 5/3/02 | 11:39:52AM | 15,339 | 16.96 | Pro XR |
| 2756 | 1180251.41 | 1903157.24 | 5/3/02 | 12:09:27PM | 16,044 | 17.74 | Pro XR |

Notes:
1. cpm = counts per minute
   pCi/g = picocuries per gram
   GPS = Global Positioning System
   ProXR = Trimble Model ProXR GPS
2. Coordinates based on State Plane - Illinois East 1983

# TABLE 2
## Downhole Gamma Results
Limited Site Investigation
DuSable Park
Chicago, Illinois
ProSource Project No. 386-00

| Test Hole>> | 512 Center | | 512 N 5 | | 512 E 5 | | 512 S 5 | | 512 W 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (inches) | cpm | pCi/g | cpm | pCi/g | cpm | pCi/g | cpm | pCi/g | cpm | pCi/g |
| 0" | 1,534 | 6.0 | 360 | 1.4 | 364 | 1.4 | 304 | 1.2 | 262 | 1.0 |
| 6" | *3,073* | *12.0* | 965 | 3.8 | 655 | 2.6 | 568 | 2.2 | 483 | 1.9 |
| 12" | *2,035* | *7.9* | 1,581 | 6.2 | 640 | 2.5 | 601 | 2.3 | 717 | 2.8 |
| 18" | 1,171 | 4.6 | 1,347 | 5.3 | 306 | 1.2 | 921 | 3.6 | 745 | 2.9 |
| 24" | 701 | 2.7 | 517 | 2.0 | 350 | 1.4 | 852 | 3.3 | 851 | 3.3 |
| 30" | | | | | 353 | 1.4 | 675 | 2.6 | 1,008 | 3.9 |
| 36" | | | | | 401 | 1.6 | | | 994 | 3.9 |
| 42" | | | | | 464 | 1.8 | | | 709 | 2.8 |
| 48" | | | | | 683 | 2.7 | | | | |
| 54" | | | | | 721 | 2.8 | | | | |
| 60" | | | | | Refusal | | | | | |

| Test Hole>> | 832 Center | | 832 S 5 | | 832 E 5 | | 832 N 5 | | 832 N 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (inches) | cpm | pCi/g | cpm | pCi/g | cpm | pCi/g | cpm | pCi/g | cpm | pCi/g |
| 0" | 1,276 | 5.0 | 260 | 1.0 | 349 | 1.4 | 254 | 1.0 | 209 | 0.8 |
| 6" | *3,416* | *13.3* | 453 | 1.8 | 998 | 3.9 | 399 | 1.6 | 405 | 1.6 |
| 12" | 1,598 | 6.2 | 465 | 1.8 | 1,435 | 5.6 | 349 | 1.4 | 820 | 3.2 |
| 18" | 593 | 2.3 | 518 | 2.0 | 440 | 1.7 | 591 | 2.3 | 757 | 3.0 |
| 24" | 474 | 1.8 | 471 | 1.8 | 387 | 1.5 | 402 | 1.6 | 611 | 2.4 |
| 30" | | | 453 | 1.8 | | | 254 | 1.0 | | |
| 36" | | | | | | | | | | |
| 42" | | | | | | | | | | |
| 48" | | | | | | | | | | |
| 54" | | | | | | | | | | |
| 60" | | | | | | | | | | |

| Test Hole>> | 1951 Center | | 1826 | | 1951 N 5 | | 1951 W 5 | | 1951 E 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (inches) | cpm | pCi/g | cpm | pCi/g | cpm | pCi/g | cpm | pCi/g | cpm | pCi/g |
| 0" | *2,738* | *10.7* | 701 | 2.7 | 625 | 2.4 | 314 | 1.2 | 291 | 1.1 |
| 6" | *3,094* | *12.1* | 1,160 | 4.5 | 997 | 3.9 | 544 | 2.1 | 462 | 1.8 |
| 12" | *2,722* | *10.6* | 700 | 2.7 | 1,054 | 4.1 | 772 | 3.0 | 564 | 2.2 |
| 18" | *2,296* | *9.0* | 635 | 2.5 | 858 | 3.3 | 743 | 2.9 | 623 | 2.4 |
| 24" | 1,510 | 5.9 | 632 | 2.5 | 686 | 2.7 | 771 | 3.0 | 621 | 2.4 |
| 30" | 1,129 | 4.4 | | | | | 768 | 3.0 | 594 | 2.3 |
| 36" | | | | | | | 848 | 3.3 | | |
| 42" | | | | | | | 828 | 3.2 | | |
| 48" | | | | | | | 814 | 3.2 | | |
| 54" | | | | | | | | | | |
| 60" | | | | | | | | | | |

| Test Hole>> | 2756 Center | | 2756 E 5 | | 2756 W 5 | | 2756 S 5 | | 2756 N 10 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (inches) | cpm | pCi/g | cpm | pCi/g | cpm | pCi/g | cpm | pCi/g | cpm | pCi/g |
| 0" | 1,125 | 4.4 | 262 | 1.0 | 350 | 1.4 | 286 | 1.1 | 277 | 1.1 |
| 6" | 2,667 | *10.4* | 342 | 1.3 | 545 | 2.1 | 470 | 1.8 | 443 | 1.7 |
| 12" | 879 | 3.4 | 488 | 1.9 | 597 | 2.3 | 522 | 2.0 | 451 | 1.8 |
| 18" | 518 | 2.0 | 490 | 1.9 | 467 | 1.8 | 508 | 2.0 | 397 | 1.5 |
| 24" | 529 | 2.1 | 558 | 2.2 | 434 | 1.7 | 497 | 1.9 | 389 | 1.5 |
| 30" | 426 | 1.7 | 528 | 2.1 | | | | | | |
| 36" | 390 | 1.5 | 503 | 2.0 | | | | | | |
| 42" | | | | | | | | | | |
| 48" | | | | | | | | | | |
| 54" | | | | | | | | | | |
| 60" | | | | | | | | | | |

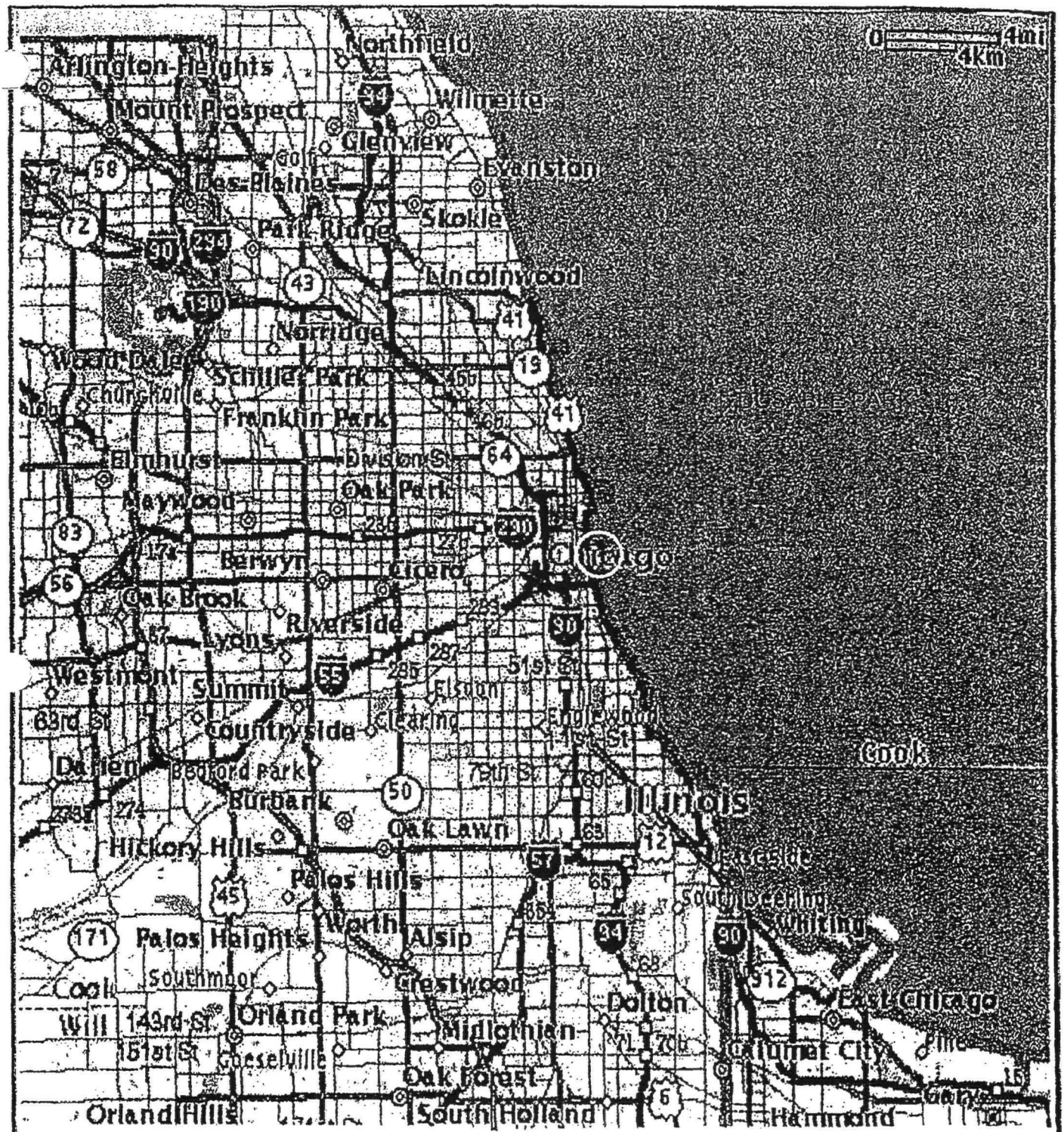
Notes:
1. Bold, italics denotes above 7.1 pCi/g or 1,849 cpm criteria.
2. [illegible] pCi/g = picocuries per gram

**TABLE 3**
**Summary of Laboratory Results**
DuSable Park
Chicago, Illinois
ProSource Project No. 00-386

| Sample # | Ra 226 | Ra 228 | Total Radium |
|---|---|---|---|
| 512 | 1.985 | 9.718 | 11.7 |
| 832 | 1.814 | 7.643 | 9.5 |
| 1951 | 0.7814 | 14.18 | 15.0 |
| 2756 | 0.1368 | 0.4431 | 0.6 |

Notes:
All data presented in picocuries per gram (pCi/g).

FIGURES




SITE LOCATION

N
W E
S

FIGURE 1
SITE LOCATION MAP
DUSABLE PARK, CHICAGO, ILLINOIS

EnSource
TECHNOLOGIES, Inc.

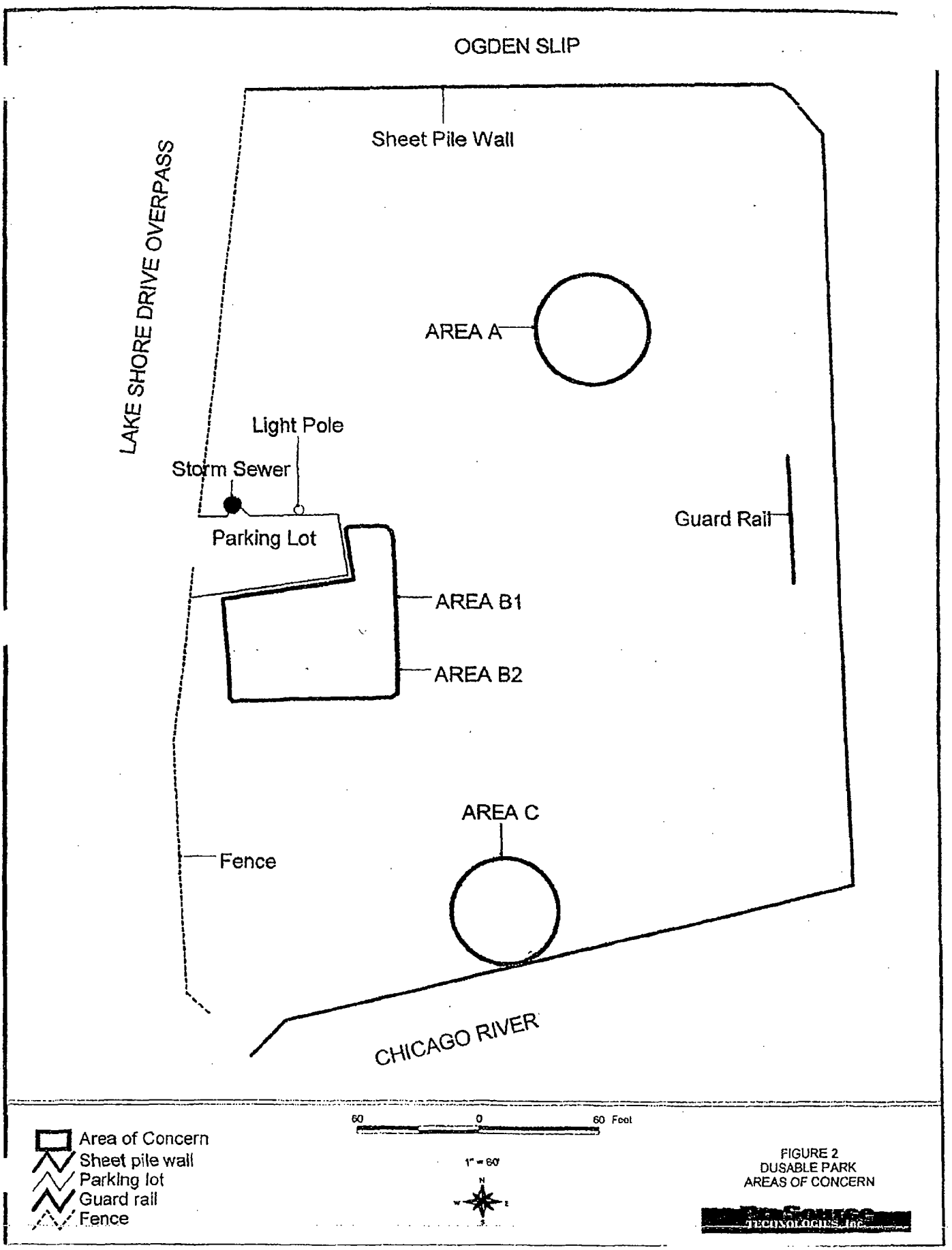
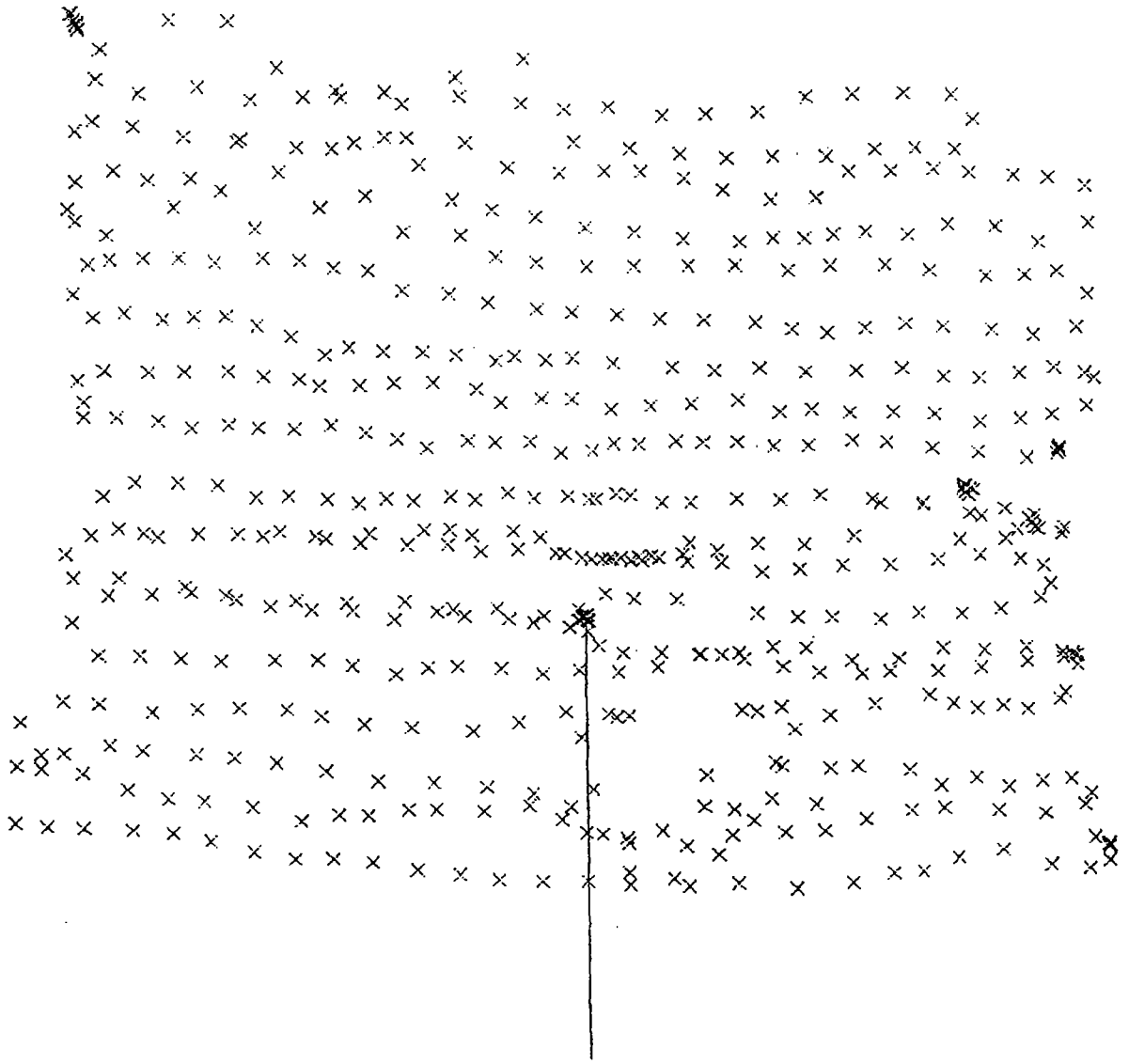



FIGURE 2
DUSABLE PARK
AREAS OF CONCERN




10 0 10 Feet

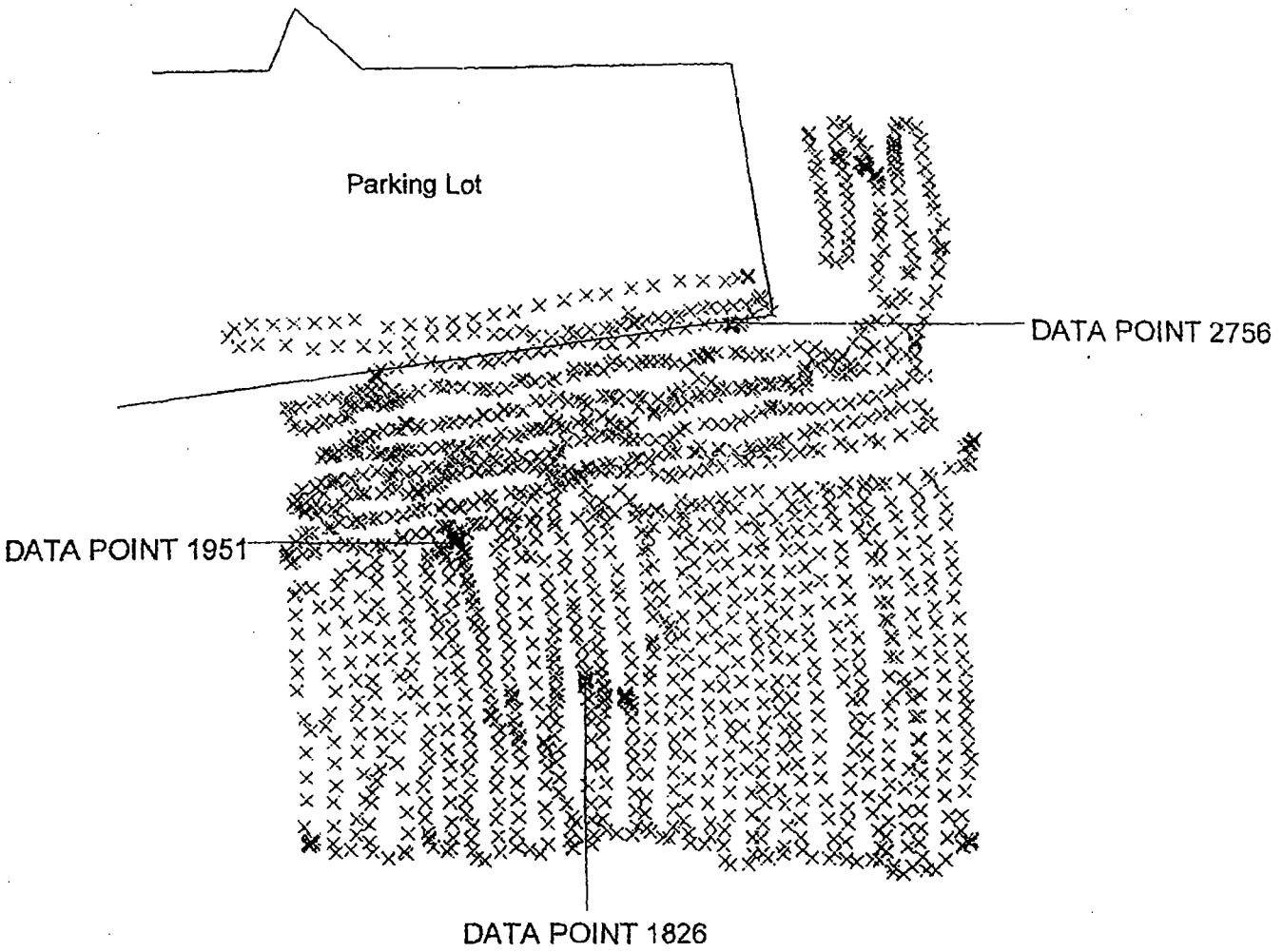
Parking lot
DuSable Park Surface Gamma Survey 5/3/02
0 - 7.09
>7.100 - 9999

1" = 10'

N
W E
S

FIGURE 3
AREA A
SURFACE GAMMA SURVEY

TECHNOLOGIES, INC




20 0 20 Feet

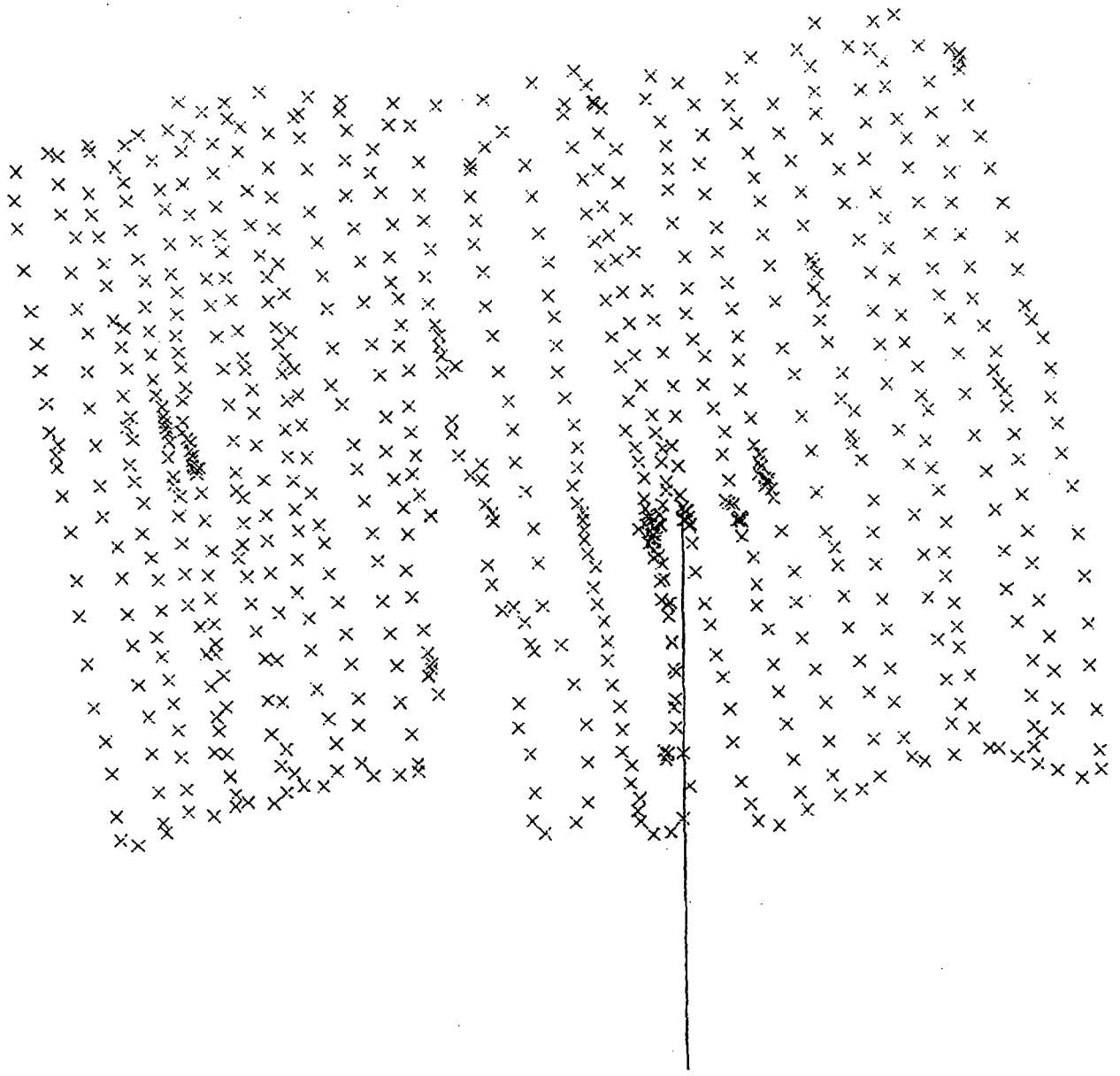
Parking lot
DuSable Park Surface Gamma Survey 5/3/02
0 - 7.09
>7.100 - 8990

1" = 20'

N
W E
S

FIGURE 4
AREA B1 AND B2
SURFACE GAMMA SURVEY

TECHSOLOGIES, INC.



DATA POINT 832

10 0 10 Feet

1" = 10'

N
W E
S

Parking lot
DuSable Park Surface Gamma Survey 5/3/02
0 - 7.09
>7.100 - 9999

FIGURE 5
AREA C
SURFACE GAMMA SURVEY

TECHNOLOGIES, Inc.

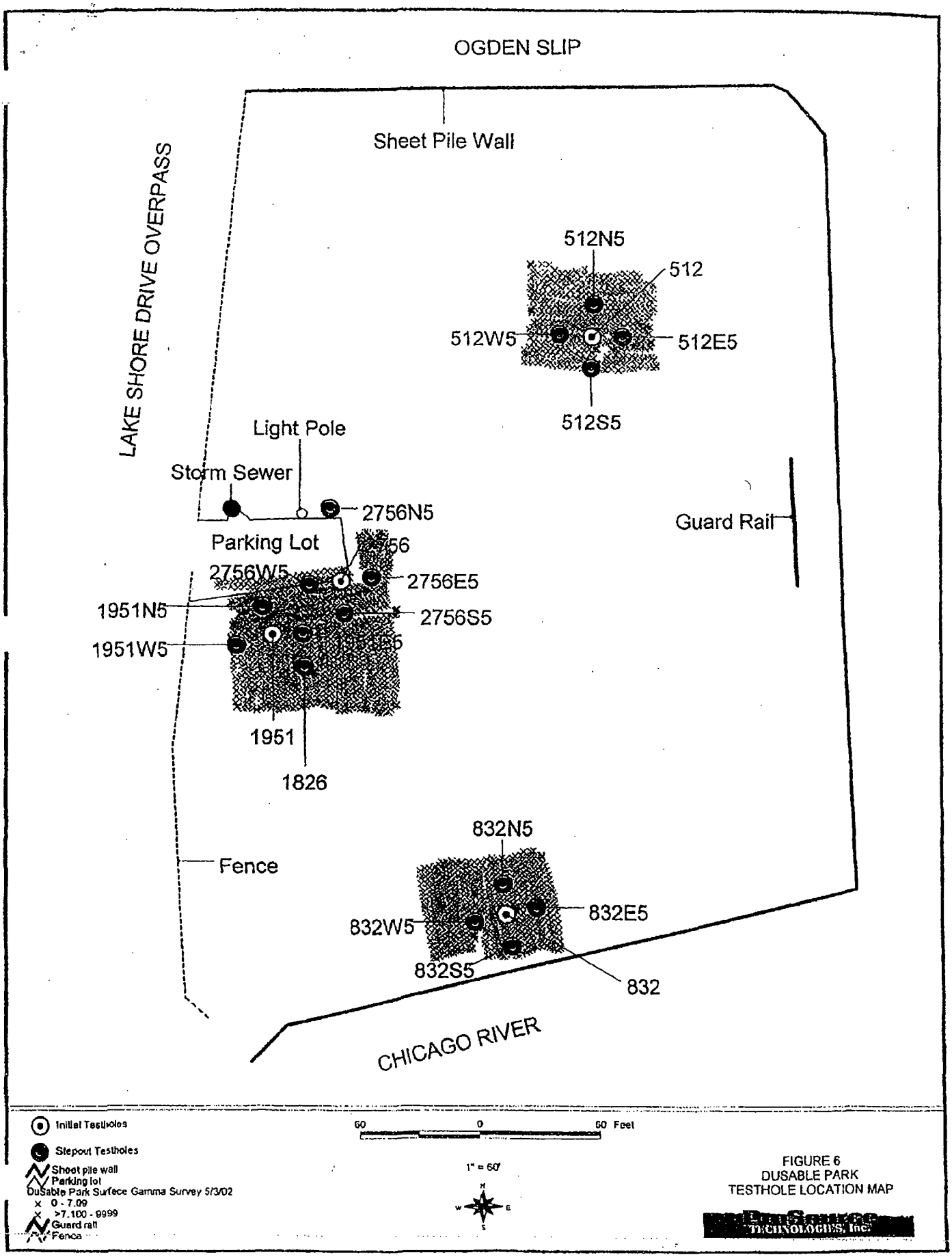



FIGURE 6
DUSABLE PARK
TESTHOLE LOCATION MAP

## APPENDIX B

### Standard Operating Procedures

| | |
|---|---|
| SOP-210 | Gamma Radiological Surveys |
| SOP-214 | Soil Sampling Procedure |
| SOP-217 | Excavation Procedure |
| SOP-223 | Verification Survey |
| SOP-320 | Radioactive Material Shipments |
| SOP-347 | Decontamination |
| SOP-364 | Sample Preparation Procedure for Gamma Spectral Analysis |

**DUSABLE PARK**

**STANDARD OPERATING PROCEDURE**

Title: Gamma Radiological Surveys

Document: SOP-210

Revision Number: 0

Date: October 5, 2007

Replaces: New

# GAMMA RADIOLOGICAL SURVEYS

## 1.0 PURPOSE

This procedure provides protocols for pre-verification or verification gamma radiological surveys.

## 2.0 SCOPE

Radiological surveys will be performed at the designated Site as part of the pre-excavation, excavation, pre-verification, and/or verification surveying programs.

## 3.0 REFERENCES

None.

## 4.0 EQUIPMENT AND MATERIALS

The following equipment may be used as part of the survey programs. Other equipment may be substituted if necessary because of availability of the items listed or the conditions encountered at the site.

- Trimble Pathfinder Pro XR 4.1 GPS (optional).
- 2-inch by 2-inch NaI (Tl) gamma detector.
- Ludlum Model 2221 portable scaler ratemeter analyzer.

## 5.0 INSTRUCTIONS FOR RADIOLOGICAL SURVEY

5.1 Establishment of Background Gamma Count Rate

5.1.1 The gamma count rate background levels shall be established for each applicable survey instrument. Six randomly selected locations of similar media (i.e., paved, landscaped, etc.) shall be chosen in non-radiologically impacted areas of the Site. A five-minute integrated count shall be obtained at the surface of each location for each survey instrument (Ludlum 2221 with 2" X 2" NaI probe). The measurements collected from each location shall be averaged to establish an instrument specific background gamma count rate.

5.2 Land Survey Procedure

5.2.1 Two perpendicular baselines will be established.

5.2.2 A grid along the baseline will be established using cloth or steel tape and a compass, if necessary. Stakes, survey flags, or paint will be placed as needed to delineate grid or traverse lines. The grids will be spaced about five meters apart.

5.2.3 The baseline, permanent structures, areas of remediation, and other areas of interest will be illustrated in the field logbook.

5.3 Gamma Survey Procedure

5.3.1 The Ludlum ratemeter is set for 2-second time-weighted average count rate.

5.3.2 Hold the survey meter probe parallel to the ground surface at a height of approximately two to six inches.

5.3.3 Walk along grid lines at a maximum speed of about 0.5 meters per second (1 mile per hour).

5.3.4 Continue surveying until all survey grids have been traversed.

5.4 Radiological Survey of On-Site Materials

5.4.1 Material that is excavated and placed in the clean stockpile will be surveyed two times. The first survey will be performed prior to excavation activities.

5.4.2 The second survey will be performed during the excavation of the non-contaminated soil.

The soils will be surveyed before they are placed in the stockpile. Based on the gamma scan, the material will either be designated as contaminated material and immediately loaded for transportation and disposal or tentatively designated as clean and stockpiled for subsequent soil sampling per SOP-214.

5.5. Daily Surveys

5.5.1 Routine daily surveys shall be performed for each day of operations at the site.

5.5.2 The routine surveys will monitor areas in the immediate vicinity of excavations and along soil movement paths to ensure that radiation levels are not affected by activities.

5.5.3 Routine surveys shall be documented by preparing a drawing of the survey results in the field logbook, indicating either the location and value of individual measurements, or contours of the measured gamma field.

5.5.4 Surveys of excavation areas will be made at the request of the Field Team Leader to assess the progress of the removal. These surveys will not be documented, but will be used by the Field Team Leader to manage the excavation.

5.6 Pre-Verification or Verification Survey

5.6.1 Upon completion of excavation activities, either a pre-verification survey shall be performed to ensure that the excavation is ready for a final verification survey by USEPA or a verification survey shall be performed to ensure that the excavation is ready for backfill based on USEPA approval.

5.6.2 The survey is conducted at the same time as the excavation work phase. The survey method is performed as specified in Sections 5.2 and 5.3. Upon completion of the survey and excavation phase, a Notification of Successful Pre-Verification or Verification is sent to the USEPA requesting a final verification survey or approval to backfill.

5.7 Site Grading Survey

5.7.1 Surveys will likely be conducted at the same time as the grading activities and will be performed as specified in Section 5.3 of this SOP.

5.7.2 The corners or boundaries of the area to be surveyed will be tied into a site-wide coordinate/survey network. Stakes, survey flags, or paint will be placed along the boundaries of the survey area using a cloth/steel tape or wheel at approximately 5 meter intervals to subdivide the area into 5 x 5 meter areas.

5.7.3 Each 5 X 5 meter area will be traversed using a line spacing of approximately 1 meter. Readings greater than twice background will be painted and flagged for further investigation.

5.7.4 The maximum gamma count and readings over twice background will be recorded on the radiation survey form for site grading. Permanent structures and other issues of interest also will be included on the radiation survey form.

**DUSABLE PARK**

**STANDARD OPERATING PROCEDURE**

Title: Soil Sampling Procedure

Document: SOP-214

Revision Number: 0

Date: October 5, 2007 Replaces: New

# SOIL SAMPLING PROCEDURE

## 1.0 PURPOSE

The purpose of this procedure is to present protocol for collecting soil samples for the Site.

## 2.0 SCOPE

This procedure applies to samples collected for radiological or geotechnical analysis. Soil samples may be collected of potential backfill soils or other soils. The Field Team Leader will coordinate the sampling efforts.

## 3.0 REFERENCES

U.S. Nuclear Regulatory Commission, NUREG/CR-5849, Manual for Conducting Radiological Surveys in Support of License Termination, June 1992.

## 4.0 EQUIPMENT AND MATERIALS

### 4.1 Equipment and Materials Management

Downhole tools and samplers are cleaned in accordance with the Decontamination Procedure (SOP-347).

Cuttings, fluids, samples, and water are placed in 55-gallons drums, labeled, properly stored on-site, and disposed of in a manner that does not violate local, state or federal rules or regulations and in a manner that does not damage public or private property.

### 4.2 Sampling Equipment and Materials

Equipment used for soil sampling includes the following:

- Auger or other Coring Tool
- Shovel and Trowel
- Plastic Collection Bags
- Plastic Sheets (optional)
- Sampling Tracking Form (Form SOP-214-1)
- Field Logbook (SOP-215)
- Field Sample Screening Form (Form SOP-214-2 or holding samples)
- Pin Flags (for marking sample locations)
- Container (for collecting potentially contaminated waste generated during the sampling process ) (e.g., gloves, plastic sheets, etc.)
- Bucket (filled with clean rinse water)
- Bucket (for homogenizing samples)
- Stainless Steel Brush
- Moist Towelettes
- Paper Towels
- Latex Gloves
- Survey Instrument (for verifying clean sampling equipment and hands).

Other equipment may be substituted, if necessary, because of availability of the items listed or the conditions encountered at the site. Substitute equipment shall be documented in the Field Logbook and approved by the Field Team Leader.